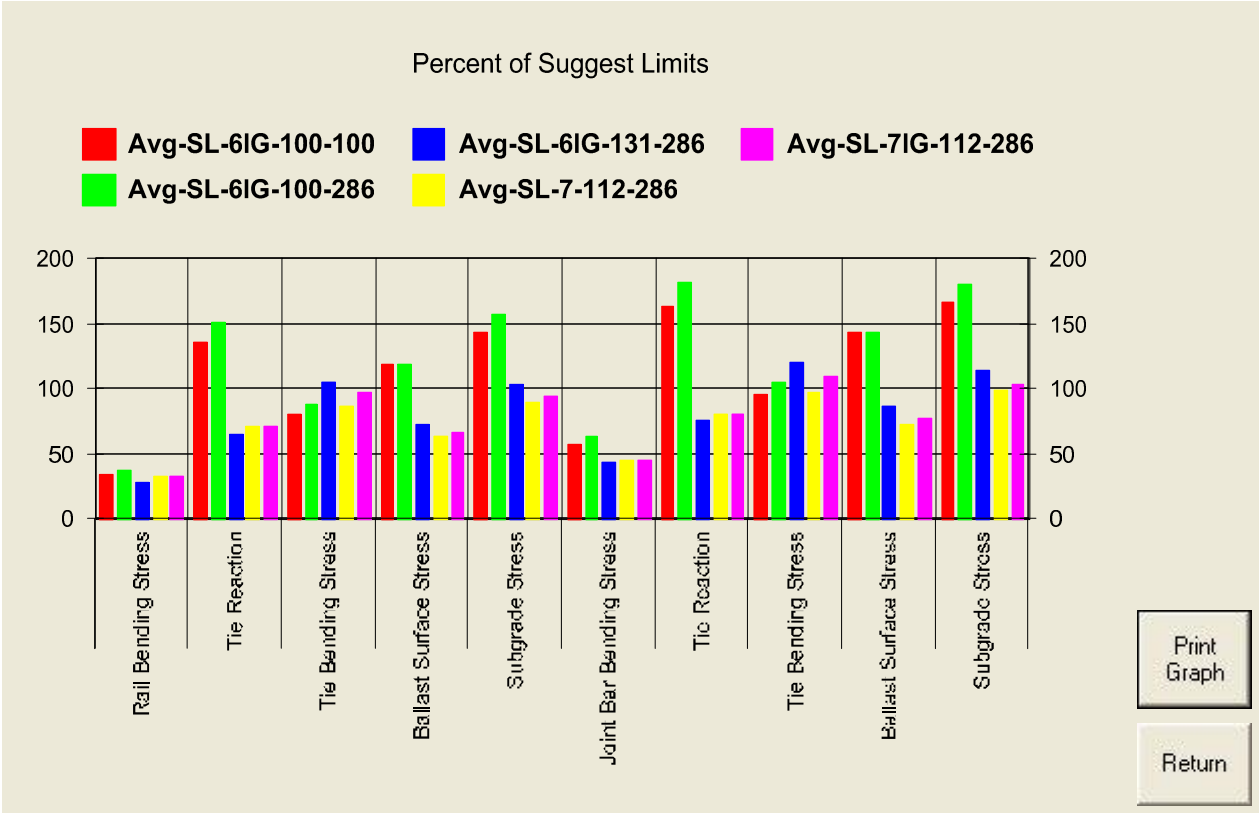
Percent of Suggest Limits
Avg-SL-6IG-100-100
Avg-SL-6IG-131-286
Avg-SL-7IG-112-286
Avg-SL-6IG-100-286
Avg-SL-7-112-286
200
150
100
50
0
Rail Bending Stress
Tie Reaction
Tie Bending Stress
Ballast Surface Stress
Subgrade Stress
Joint Bar Bending Stress
Tie Reaction
Tie Bending Stress
Ballast Surface Stress
Subgrade Stress
Print Graph
Return

Track 3.0 Structural Evaluation Program Report

04-26-2008
C:\Trk3.0\Avg-SL-6-100.tk3

Assumed Existing Average Shortline Conditions

Loading	
Car Type	Hopper, 100 T (263 K)
Operating Level	10 MPH or less
Design Wheel Load	36,190 lbs
Rail	
Rail Weight	100 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	6 in x 8 in
Wood Type	hardwood
Tie Plate Size	8.0 in x 6.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	high
Typical Tie Condition	fair
Tie Grade	industrial
Most Important Defect Type	spike killed tie
Moment of Inertia	114.00 in^4
Modulus of Elasticity	368,333 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1/4" to 1"
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	38,319 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	11,027 psi	32,000 psi	34%	Jt. Bar Bending Stress	20,300 psi	35,000 psi	58%
Tie Reaction	15,504 lbs	11,400 lbs	136%	Tie Reaction	18,697 lbs	11,400 lbs	164%
Tie Bending Stress	740 psi	920 psi	80%	Tie Bending Stress	886 psi	920 psi	96%
Ballast Surface Stress	91 psi	76 psi	119%	Ballast Surface Stress	109 psi	76 psi	144%
Subgrade Stress	66.2 psi	46.0 psi	144%	Subgrade Stress	76.2 psi	46.0 psi	166%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-6-100-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	100 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	6 in x 8 in
Wood Type	hardwood
Tie Plate Size	8.0 in x 6.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	high
Typical Tie Condition	fair
Tie Grade	industrial
Most Important Defect Type	spike killed tie
Moment of Inertia	114.00 in^4
Modulus of Elasticity	368,333 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	11,955 psi	32,000 psi	37%	Jt. Bar Bending Stress	22,009 psi	35,000 psi	63%
Tie Reaction	17,207 lbs	11,400 lbs	151%	Tie Reaction	20,751 lbs	11,400 lbs	182%
Tie Bending Stress	805 psi	920 psi	88%	Tie Bending Stress	964 psi	920 psi	105%
Ballast Surface Stress	102 psi	86 psi	119%	Ballast Surface Stress	123 psi	86 psi	143%
Subgrade Stress	72.1 psi	46.0 psi	157%	Subgrade Stress	82.9 psi	46.0 psi	180%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-6IG-112-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car & 112 # Rail

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	112 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	6 in x 8 in
Wood Type	hardwood
Tie Plate Size	12.0 in x 8.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	2
Typical Tie Condition	fair
Tie Grade	industrial
Most Important Defect Type	spike killed tie
Moment of Inertia	144.00 in^4
Modulus of Elasticity	850,000 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	10,418 psi	32,000 psi	33%	Jt. Bar Bending Stress	20,190 psi	45,000 psi	45%
Tie Reaction	16,316 lbs	22,900 lbs	71%	Tie Reaction	18,449 lbs	22,900 lbs	81%
Tie Bending Stress	1,026 psi	920 psi	112%	Tie Bending Stress	1,152 psi	920 psi	125%
Ballast Surface Stress	70 psi	86 psi	81%	Ballast Surface Stress	79 psi	86 psi	92%
Subgrade Stress	50.7 psi	46.0 psi	110%	Subgrade Stress	55.8 psi	46.0 psi	121%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-7IG-112-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car & 112 # Rail & 7" IG Ties

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	112 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	7 in x 9 in
Wood Type	hardwood
Tie Plate Size	12.0 in x 8.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	10 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	2
Typical Tie Condition	fair
Tie Grade	industrial
Most Important Defect Type	spike killed tie
Moment of Inertia	257.00 in^4
Modulus of Elasticity	850,000 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	10,418 psi	32,000 psi	33%	Jt. Bar Bending Stress	20,190 psi	45,000 psi	45%
Tie Reaction	16,316 lbs	22,900 lbs	71%	Tie Reaction	18,449 lbs	22,900 lbs	81%
Tie Bending Stress	893 psi	920 psi	97%	Tie Bending Stress	1,002 psi	920 psi	109%
Ballast Surface Stress	58 psi	86 psi	67%	Ballast Surface Stress	66 psi	86 psi	77%
Subgrade Stress	43.2 psi	46.0 psi	94%	Subgrade Stress	47.5 psi	46.0 psi	103%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-7-112-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car & 112 # Rail & 7" ML Ties

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	112 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	7 in x 9 in
Wood Type	hardwood
Tie Plate Size	12.0 in x 8.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	2
Typical Tie Condition	fair
Tie Grade	AREMA mainline
Most Important Defect Type	spike killed tie
Moment of Inertia	257.00 in^4
Modulus of Elasticity	1,000,000 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	10,418 psi	32,000 psi	33%	Jt. Bar Bending Stress	20,190 psi	45,000 psi	45%
Tie Reaction	16,316 lbs	22,900 lbs	71%	Tie Reaction	18,449 lbs	22,900 lbs	81%
Tie Bending Stress	943 psi	1,080 psi	87%	Tie Bending Stress	1,058 psi	1,080 psi	98%
Ballast Surface Stress	55 psi	86 psi	64%	Ballast Surface Stress	63 psi	86 psi	73%
Subgrade Stress	41.3 psi	46.0 psi	90%	Subgrade Stress	45.5 psi	46.0 psi	99%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-6IG-131-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car & 131 # Rail

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	131 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	6 in x 8 in
Wood Type	hardwood
Tie Plate Size	12.0 in x 8.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	2
Typical Tie Condition	fair
Tie Grade	industrial
Most Important Defect Type	spike killed tie
Moment of Inertia	144.00 in^4
Modulus of Elasticity	850,000 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	9,031 psi	32,000 psi	28%	Jt. Bar Bending Stress	19,697 psi	45,000 psi	44%
Tie Reaction	14,997 lbs	22,900 lbs	65%	Tie Reaction	17,468 lbs	22,900 lbs	76%
Tie Bending Stress	970 psi	920 psi	105%	Tie Bending Stress	1,107 psi	920 psi	120%
Ballast Surface Stress	63 psi	86 psi	73%	Ballast Surface Stress	74 psi	86 psi	86%
Subgrade Stress	47.8 psi	46.0 psi	104%	Subgrade Stress	52.5 psi	46.0 psi	114%

Track 3.0 Structural Evaluation Program Report

04-26-2008

C:\Trk3.0\Avg-SL-7-131-286.tk3

Assumed Existing Average Shortline Conditions with 286k Car & 131 # Rail & 7" ML Ties

Loading	
Car Type	286,000 lb car (120 ton)
Operating Level	10 MPH or less
Design Wheel Load	39,380 lbs
Rail	
Rail Weight	131 lbs/yd
Rail Section Type	AREA
Joint Bolt State -	tight
Ties	
Cross Section Dimensions	7 in x 9 in
Wood Type	hardwood
Tie Plate Size	12.0 in x 8.0 in
Spacing	18.0 in
Age	25 years
Average Remaining Tie Life	5 years
Tie Modulus/Stress Reduction Factor	0.43
Decay Hazard	2
Typical Tie Condition	fair
Tie Grade	AREMA mainline
Most Important Defect Type	spike killed tie
Moment of Inertia	257.00 in^4
Modulus of Elasticity	1,000,000 psi
Ballast	
Ballast Depth	3 in
Most Common Particle Sizes	1
Drainage Quality	fair
Number of Wet Days	0
Modulus of elasticity	42,529 psi
Subgrade	
Classification System	ASTM
Source of Allowable Subgrade Stress	Program
Subgrade Drainage Quality	fair
Modulus of Elasticity	12,000 psi
Soil Classification	GC -Clayey Gravels

****Note****: Least Reliable Method of Determining Subgrade E.

Description At rail section:	Stresses and Loads	Suggested Limits	% of Limits	Description At a joint:	Stresses and Loads	Suggested Limits	% of Limits
Rail Bending Stress	9,031 psi	32,000 psi	28%	Jt. Bar Bending Stress	19,697 psi	45,000 psi	44%
Tie Reaction	14,997 lbs	22,900 lbs	65%	Tie Reaction	17,468 lbs	22,900 lbs	76%
Tie Bending Stress	892 psi	1,080 psi	83%	Tie Bending Stress	1,018 psi	1,080 psi	94%
Ballast Surface Stress	48 psi	86 psi	56%	Ballast Surface Stress	58 psi	86 psi	67%
Subgrade Stress	38.9 psi	46.0 psi	85%	Subgrade Stress	42.8 psi	46.0 psi	93%